WARM-UP

① Solve the system:

$$\begin{cases} 3x + 2y - z = 4 \\ x + y + 3z = 1 \\ -2x + y - 5z = -5 \end{cases}$$

② Multiply:

a) $\begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

b) $\begin{bmatrix} 3 & 2 & -1 \\ 1 & 1 & 3 \\ -2 & 1 & -5 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

① $3x + 2y - z = 4$
② $x + y + 3z = 1$
③ $-2x + y - 5z = -5$

STEP 1: Make a system with 2 variables.

② $x + y + 3z = 1$
③ $-2x + y - 5z = -5$
④ $3x + 8z = 6$

① $3x + 2y - z = 4$
② $\times(-2)$ $x + y + 3z = 1$
$-2x - 2y - 6z = -2$
⑤ $x - 7z = 2$

STEP 2: Solve ④ & ⑤ for x, z

④ $3x + 8z = 6$
⑤ $x - 7z = 2$ sub $\Rightarrow$ $x = 7z + 2$

④ $3(7z + 2) + 8z = 6$
$21z + 6 + 8z = 6$
$-6 \quad -6$
$29z = 0$
$z = 0$

$x = 2$

STEP 3: Plug in x & z into ①, ②, or ③

② $x + y + 3z = 1$
$2 + y + 3(0) = 1$
$-2 \quad -2$
$y = -1$

(x, y, z)
$(2, -1, 0)$

STEP 4: CHECK!

All of ①, ②, ③

a) $\begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 2\cdot 1 + 4\cdot 0 & 2\cdot 0 + 4\cdot 1 \\ 1\cdot 1 + 3\cdot 0 & 1\cdot 0 + 3\cdot 1 \end{bmatrix}$

identity matrix

$4 \cdot 1 = 4$

$= \begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}$

$AB \neq BA$

b) $\begin{bmatrix} 3 & 2 & -1 \\ 1 & 1 & 3 \\ -2 & 1 & -5 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 3x + 2y & -1z \\ x + y & +3z \\ -2x + y & -5z \end{bmatrix}$

$(3 \times 3)(3 \times 1)$

3×1

Tues. (Nov. 9): Inverse Matrix & Solving Systems
HW: Extended Problem & Some book problems

Thurs. (Nov. 11): Solving Systems using Inverse Matrices and Calculators
HW: Section 4 Review

Mon. (Nov. 15): Review for Assessment.

- Solving 3-variable systems algebraically (elimination/substitution)
- Adding/Subtracting/Multiplying Matrices & solving for X
- Finding the inverse matrix
- Using the inverse matrix to solve 2-variable systems
- Using the calculator to solve 3 or more variable systems (inverses)

Wed. (Nov. 17): Section 4 Assessment.

$$\underbrace{\begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}}_{A} \cdot \underbrace{\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}}_{I} = \underbrace{\begin{bmatrix} 2 & 4 \\ 1 & 3 \end{bmatrix}}_{A}$$

$$AI = A$$

Try $\cancel{\frac{1}{3}} \cdot 3x = 151 \cdot \cancel{\frac{1}{3}}$ $\boxed{3}\boxed{x^{-1}} = .3\overline{3} = \frac{1}{3}$

$$3^{-1} \cdot 3x = 151 \cdot 3^{-1}$$

$$x = 151 \cdot 3^{-1}$$

$$3^{-1} = \frac{1}{3}$$

$$AI = A$$

$$\cancel{A \cdot A^{-1}}\, I = A \cdot A^{-1}$$

$$I = A \cdot A^{-1}$$

$$\begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix} \cdot \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$A \cdot A^{-1} = I$$

$$\begin{bmatrix} 2a+c & 2b+d \\ 4a+3c & 4b+3d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$2a+c=1 \qquad 2b+d=0$$
$$4a+3c=0 \qquad 4b+3d=1$$

$$A^{-1} = \begin{bmatrix} a= & b= \\ 1.5 & -0.5 \\ c= & d= \\ -2 & 1 \end{bmatrix}$$

For any matrix $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$

$$A^{-1} = \frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

ex/ $A = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix} \Rightarrow A^{-1} = \frac{1}{6-4}\begin{bmatrix} 3 & -1 \\ -4 & 2 \end{bmatrix}$

$$= \frac{1}{2}\begin{bmatrix} 3 & -1 \\ -4 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} 1.5 & -.5 \\ -2 & 1 \end{bmatrix}$$

$$2x + 4y = 10$$
$$x + 4y = 9$$

$x = 1, y = 2$

$$\begin{bmatrix} 2 & 4 \\ 1 & 4 \end{bmatrix}^{-1} \begin{bmatrix} 2 & 4 \\ 1 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 10 \\ 9 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 & 4 \\ 1 & 4 \end{bmatrix}^{-1} \begin{bmatrix} 10 \\ 9 \end{bmatrix}$$

$$\frac{1}{8-4} \begin{bmatrix} 4 & -4 \\ -1 & 2 \end{bmatrix}$$

$$\frac{1}{4} \begin{bmatrix} 4 & -4 \\ -1 & 2 \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} 1 & -1 \\ -\frac{1}{4} & \frac{1}{2} \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ -1/4 & 1/2 \end{bmatrix} \begin{bmatrix} 10 \\ 9 \end{bmatrix}$$

$$= \begin{bmatrix} 10 - 9 \\ -\frac{10}{4} + \frac{9}{2} \end{bmatrix} = \begin{bmatrix} 1 \\ -\frac{10}{4} + \frac{18}{4} \end{bmatrix}$$

$$= \begin{bmatrix} 1 \\ \frac{8}{4} \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$$

$$\begin{bmatrix} -1 & 1 \end{bmatrix}$$

$$3x - 4y + 2z = 1$$

$$4x + 5y + 10z = 2$$

$$3x + 16y - 2z = 17$$

HW: Sect. 4.3 (p.187): #17, 18

Sect. 4.5 (p.203): #1, 2, 14, 15

Sect. 4.7 (p.217): #1, 2, 7

EXT. ~~WRITE~~ PROB.: DUE THURS.

TEST CORRECTIONS DUE MON. (ON SEPERATE PAPER)

1. Correction
2. Why you were incorrect.